CLAIMS

What is claimed is:

1. The method of forming a nano-supported catalyst on a substrate, comprising:

configuring a substrate with an electrode;

immersing said substrate with said electrode into a solvent containing a first metal salt and a second metal salt, wherein said first metal salt and said second metal are soluble in said solvent; and

applying a bias voltage to said electrode such that a nano-supported catalyst is at least partly formed from said first metal salt and said second metal salt on said substrate at said electrode, wherein said nano-supported catalyst has an active catalytic particle with at least one dimension that is greater than one tenth of a nanometer and less than about five hundred nanometers.

2. The method of Claim 1, wherein said active catalytic particle is derived from said second metal salt and selected from the group consisting of iron, nickel, cobalt, ruthenium, rhodium, palladium, rhenium, osmium, iridium, platinum, and a combination thereof.

3. The method of claim 1, wherein said active catalytic particle is comprised of a metal oxide support that is derived from said first metal salt and selected from the group consisting of alumina, magnesium oxide, calcium oxide, and a combination thereof.

4. The method of claim 1, further comprising removing oxygen from said active catalytic particle contained in said nano-supported catalyst.

5. A method of forming a nano-supported catalyst on a substrate, comprising:

configuring a substrate with an electrode;

immersing said substrate with said electrode into a first solvent containing a first metal salt, wherein said first metal salt is soluble in said first solvent;

applying a first bias voltage to said electrode such that a nano-supported catalyst is at least partly formed from said first metal salt on said substrate at said electrode;

removing said substrate from said first solvent containing said first metal salt;

immersing said substrate with said electrode into a second solvent containing a second metal salt, wherein said second metal salt is soluble in said second solvent; and

applying a second bias voltage to said electrode in said solvent such that said nano-supported catalyst is partly formed from said second metal salt on said first electrode, wherein said nano-supported catalyst has an active catalytic particle that has at least one dimension greater than about one tenth of a nanometer and less than about five hundred nanometers.

6. The method of Claim 5, wherein said active catalytic particle is derived from said second metal salt and selected from the group consisting of iron, nickel, cobalt, ruthenium, rhodium, palladium, rhenium, osmium, iridium, platinum, and a combination thereof.

7. The method of claim 5, wherein said active catalytic particle is comprised of a metal oxide support that is derived from said first metal salt and selected from the group consisting of alumina, magnesium oxide, calcium oxide, and a combination thereof.

8. The method of claim 5, further comprising removing oxygen from said active catalytic particle contained in said nano-supported catalyst.

9. A method of forming at least one nanotube on a substrate, comprising:

configuring a substrate with an electrode;

immersing said substrate with said electrode into a solvent containing a first metal salt and a second metal salt, wherein said first metal salt and said second metal are soluble in said solvent;

applying a bias voltage to said electrode such that a nano-supported catalyst is at least partly formed from said first metal salt and said second metal salt on said substrate at said electrode; and

conducting a chemical reaction process to grow at least one nanotube on said nano-supported catalyst formed at least in part from said first metal salt and said second metal salt.

10. The method of claim 9, where said chemical reaction process is selected from the group consisting of catalytic decomposition, pyrolysis, chemical vapor deposition, and Hot Filament Chemical Vapor Deposition (HTCVD)

11. The method of claim 9, wherein said nano-supported catalyst has an active catalytic particle with at least one dimension greater than about one tenth of a nanometer and less than about five hundred nanometers.

12. The method of claim 10, wherein said nano-supported catalyst is derived from said second metal and selected from the group consisting of iron, nickel, cobalt, ruthenium, rhodium, palladium, rhenium, osmium, iridium, platinum, and a combination thereof.

13. The method of claim 9, wherein said at least one dimension that is less than about ten nanometers.

14. The method of claim 9, wherein said at least one dimension that is less than about three nanometers.

15. The method of claim 9, wherein said at least one dimension that is less than about one nanometer.

16. The method of claim 9, wherein said nano-supported catalyst has a metal oxide support derived from said first metal salt and selected from the group consisting of alumina, magnesium oxide, calcium oxide, and a combination thereof.

17. The method of claim 9, wherein said solvent is selected from the group consisting of water and alcohol and a combination thereof.

18. The method of claim 9, wherein said chemical reaction process is conducted at a nanotube growth temperature that is less than about six hundreds and fifty degrees Celsius.

19. The method of claim 9, wherein said chemical reaction process is conducted at a nanotube growth temperature that is less than about six hundreds degrees Celsius and greater than about five hundreds degrees Celsius.

20. The method of claim 9, wherein said substrate is selected from the group comprising borosilicate glass and sodalime glass.